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CONTROL

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TITLE

CONTROL OF THE MOUNTAIN PINE BEETLE  
IN WESTERN WHITE PINE WITH D.D.T.  
1944-45

by  
Archie L. Gibson  
Associate Entomologist

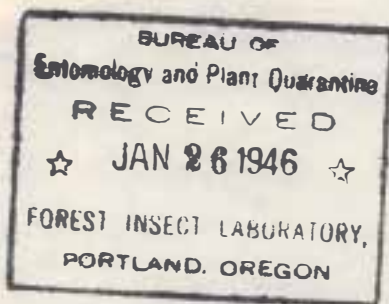
Forest Insect Laboratory  
Coeur d'Alene, Idaho  
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Agricultural Research Administration  
Forest Insect Laboratory  
Coeur d'Alene, Idaho



January 25, 1946

To: F. C. Craighead, In Charge, Forest Insect Investigations  
From: James C. Evenden, Box 630, Coeur d'Alene, Idaho  
Subject: DDT - Mountain Pine Beetle Control

I am enclosing two copies of a report by Mr. A. L. Gibson covering the experiments conducted in connection with the control of the mountain pine beetle in western white pine with DDT. We will be pleased to have your comments concerning the results of these tests.

cc: F. P. Keen  
R. L. Furnise ✓  
M. D. Wygant  
Eastern Laboratories

CONTROL OF THE MOUNTAIN PINE BEETLE  
IN WESTERN WHITE PINE WITH D.D.T.  
1944-45

by  
Archie L. Gibson  
Associate Entomologist

In the search for cheaper and more effective means of controlling the mountain pine beetle it was decided to test D.D.T. as a lethal agent. As conditions under which it might prove effective seemed so limited, it was decided to make only a few exploratory tests initially. There appeared to be only the following possibilities of effecting control with this chemical:

- (1) By employing a solvent of DDT which would carry it thru the bark of infested trees and thus destroy the brood beneath by contact.
- (2) By contact with spray residue on bark surface occurring when new adults just emerging from host tree, walk over the bark surface prior to flight.
- (3) By contact with spray residue on the bark as the new adults walk over more or less of the treated bark surface of the tree it is about to attack.

Contact with spray residue seemed to offer greatest possibilities of success so it was decided to initiate experiments based on 2 and 3.

The place selected for the experiments was on the Yellow Dog Creek drainage of the Coeur d'Alene National Forest where an active infestation of the mountain pine beetle in western white pine was present.

Materials chosen for the tests were green unattacked western white pine about 14 inches in diameter breast high and slabs from a white pine containing mountain pine beetle brood in the larger larval stages.

The plan of the experiments was to force attack of the trees by caging infested slabs and a green tree in a tepee-type cage of window screen. These cages enclosed the base of the selected tree from the



ground to a height of about 7 feet. Enough infested slabs were placed in the cage around the base of the tree to produce a heavy attack if normal brood emergence occurred.

As the transportation of materials for an emulsion is decidedly less of a problem than that of oil-base sprays, especially if control is in an area remote from roads, initial tests were planned with emulsions.

Spraying was by means of a Smith-Banner pressure garden sprayer of 3 to 4 gallons capacity. Spray was applied until a condition of surface saturation and imminent run-off was reached. To avoid any unpremeditated exposure of the experiments to spray, treating was done at least 50 feet distant from untreated material used in the experiments. In experiment 1, the tree was sprayed and untreated infested slabs placed in the cage. Experiment 2 was a check on the treatments in experiments 1 and 3 and consisted of caged tree and slabs with all conditions similar except that neither were treated. Slabs were enclosed with a green tree in experiment 3 after they had been sprayed. The experiments are briefly outlined in Table I.

Table I

PRELIMINARY EXPERIMENTS TO DETERMINE CONTROL EFFECTIVENESS OF  
D.D.T. AGAINST THE MOUNTAIN PINE BEETLE IN  
WESTERN WHITE PINE 1944 - 45

Exo. (1)	Material Sprayed	Number and Status of Infested Slabs	Caged Tree Condition
1	Tree	8 Untreated	Green, Unattacked
2	None - check	8 Untreated	" "
3	Infested Slabs	8 Sprayed	" "

(1) The spray used was as follows: 80 grams DDT, 800 c.c. of Diesel Oil, 40 c.c. of Triton 720, 3120 c.c. of water

Experiment 1 was designed to determine if brood emerging from the untreated slabs within the cage could attack the sprayed tree. Experiment 3 was designed to determine if brood could emerge from treated material and successfully attack an untreated tree. The preceding experiments were begun with the expectancy that the brood would emerge later in the season of 1944 and conclusions could then be drawn.

In mid-October, examination of the cages by Evenden and Gibson revealed only a few attacks on the tree in Experiment 2, the check.

There was no indication that development of brood in material in the other cages had resulted in any emergence in the fall of 1944. A similar condition was noted in late June of the following year, 1945.

The experiments had been located on the edge of a flat at the bottom of the Yellow Dog Creek drainage in the shade of a high, fairly dense crown canopy at the foot of a steep, north-facing slope. This cool site, combined with subnormal temperatures during part of the summer of 1944, prevented all but a very small amount of emergence in one cage up to the fall of 1944. The same condition prevailed the following spring and a final examination was not made until late October of 1945.

It was believed the long period between treatment and emergence of brood, and consequent exposure of spray residue to a great deal of rain and snow, might reduce if not completely nullify the effectiveness of the treatment. Therefore, a second series of three experiments was initiated in late June of 1945, with certain changes in formulas and technique.

Materials selected and manner of spraying were similar to those used in the first series but a nearby site on a south-facing slope, slightly above creek-bottom level and in a more open stand of timber on the north side of Yellow Dog Creek, was chosen.

Each of two tepee-type cages in this second series of experiments contained untreated infested material (slabs) and a sprayed, unattacked green tree. The third cage contained untreated slabs and an untreated, green tree to serve as a check on the results. As in the first series of experiments, caging the infested slabs with the treated tree gave the emerging insects no available host but the treated tree. This second set of experiments is outlined in the succeeding tabulation.

EXPERIMENTS TO DETERMINE CONTROL EFFECTIVENESS OF  
D.D.T. AGAINST THE MOUNTAIN PINE BEETLE IN  
WESTERN WHITE PINE 6-26-45

Exp.	Material Sprayed	Status of Infested Slabs	Caged Tree Condition	Formula Used	
45-1	None	Untreated	Green, unattacked	check	
45-2	Tree	Untreated	" "	5 oz. D.D.T. 10 oz. Xylene .6 oz. Triton 720 4½ Qts. of Water	3.2% DDT
45-3	Tree	Untreated	" "	8 oz. D.D.T. 1 pint Xylene 1 oz. Triton 720 4½ Qts. of Water	4.8% DDT



All experiments were examined on July 31, 1945, but emergence and attack were incomplete at that time so the cages which had been opened, were closed again. A few adults were noted on the outside of the screen of cages 45-1 and 45-2 of the experiments initiated in 1945. A final examination was made of both series of experiments in late October 1945. The results were as follows:

D.D.T. FOR CONTROL OF THE MOUNTAIN PINE BEETLE  
IN WESTERN WHITE PINE  
DATA FROM EXPERIMENTS BEGUN IN 1944

<u>Data from Slabs</u>							
<u>Brood Status</u>							
Exp.	Material Sq.Ft. Sprayed Exam.	Dead	Emergent	Percent Attacks Emergent on Tree	% of Control		
1	Tree	2	22 pupae and callow adults	60	73.2	11 inside of cage	97.5
2	None- check	2	14 pupae and callow adults	60	81.1	Heavy both inside cage and above it	None
3	Slabs	2	178 callow adults in light brown stage	5	2.7	None on either caged portion of tree or above it	100

Only eleven attacks on the sprayed tree in experiment 1 indicates the spray on the bark was almost wholly effective in preventing attack even after the lapse of nearly 11 months and exposure to the rain and snow of winter. Based on the data from the two square feet examined, it is estimated that about 450 insects had emerged from the approximate 15 square feet of bark surface in the slabs. The eleven attacks from the estimated 450 insects indicates about 97.5 percent of the brood was killed by the treatment; exceptionally good control when it is considered that most, if not all, of the emergence occurred in 1945 at least 10 months after the tree was treated. The check experiment under similar environmental conditions nearby, showed only a few attacks on the caged tree in the fall of 1944 but a very heavy attack in 1945.

A surprising condition noted in experiment 3, begun in 1944, was the heavy mortality in the treated slabs. Brood had developed largely to the callow adult stage and then died, apparently from the effect of the spray. In some cases much of the brood had not only reached the callow adult stage but had even done much of the pre-emergence excavation

of the inner bark before dying. The contrast between at least 80 percent emergence from unsprayed slabs in the check experiment and only 2.7 emergence from the sprayed slabs in experiment 3, obviously indicates the excellent control effect of the spray thru the bark. Lack of attacks on the tree indicates that what few adults did emerge were probably killed by contact with spray residue on the bark surface of the slabs. No attacks were found either on the caged portion of the tree or above it.

The spray, an emulsion, used in the experiments begun in 1944, contained only about 2 percent DDT.

The results from the experiments begun in 1945 were equally encouraging. The data is summarized in the following tabulation.

#### DATA FROM EXPERIMENTS BEGUN IN 1945

Exp.	Material Sprayed	Sq.Ft. Exam.	Data from Slabs		Percent Emerged	Attacks on Tree	Percent Control
			Dead	Emerged			
45-1	None-check	1.5	1	38	97.4	Normal	None
45-2	Tree	2	3	102	97.1	None	100
45-3	Tree	2	9	88	90.7	None	100

Emergence from untreated slabs and attack of caged, untreated green tree in experiment 45-1 were entirely normal. Emergence from slabs enclosed in cages in experiments 45-2 and 45-3 was also normal but none of the emerging brood attacked the enclosed trees. The caged tree in experiment 45-2 showed three attacks on the unsprayed area above the screen but none were noted above the screen in experiment 45-3.

The emulsions used in the preceding two experiments contained approximately 3.2 and 5.0 percent D.D.T.

#### CONCLUSION

The preceding experiments are too few on which to base definite conclusions as to the effectiveness of DDT in controlling the mountain pine beetle in western white pine. However, the excellent results indicate the need for further similar as well as other experiments. In two experiments, the long period between time of spraying and

exposure of mountain pine beetle brood to spray deposit, indicate we may expect DDT emulsions to give excellent control many months after their application. This deferred control effect applies not only to infested material which has been sprayed, but also to treated green trees which they attempt to attack.

A further tentative conclusion is that trees of high aesthetic value may be sprayed with DDT at the beginning of the summer season and remain immune to attack for the entire season.

The excellent results with sprays containing 2.0, 3.2 & 5.0 percent of DDT indicate an even lower percent of DDT to carrier may be effective, thus permitting a reduction in cost of spray per gallon.

In view of the favorable results secured, more experiments to explore the effectiveness of this insecticide should be conducted.